SELA

AngularJS

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What Is AngularJS?

- An MV* framework for developing CRUD style web applications
- Developed by Google
- Works on all modern web browsers
- Open source (MIT license)
- No external dependencies
- Very opinionated

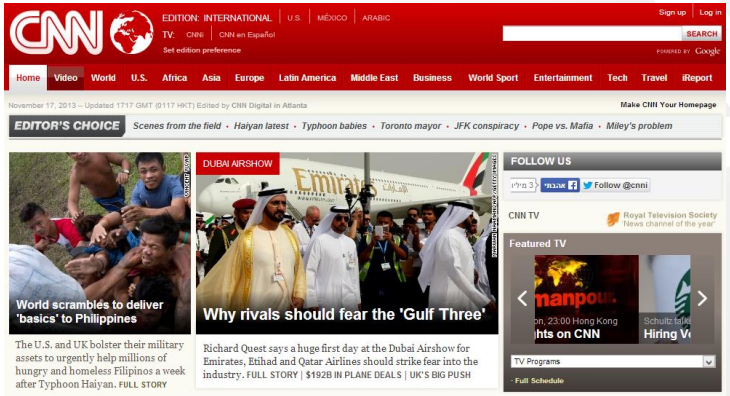
Agenda

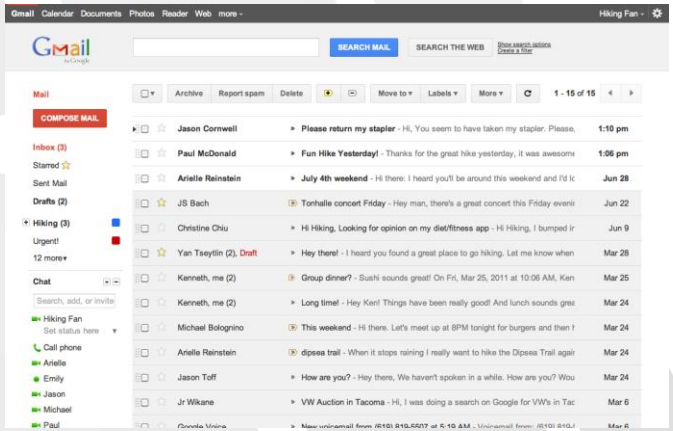
- The Modern Web
- Introduction to AngularJS
- Setting Up The Environment
- Services
- Filters
- Validation
- Routing
- Testing

The Modern Web

The Modern Web

- From web pages to web applications
- More and more logic is pushed to the client



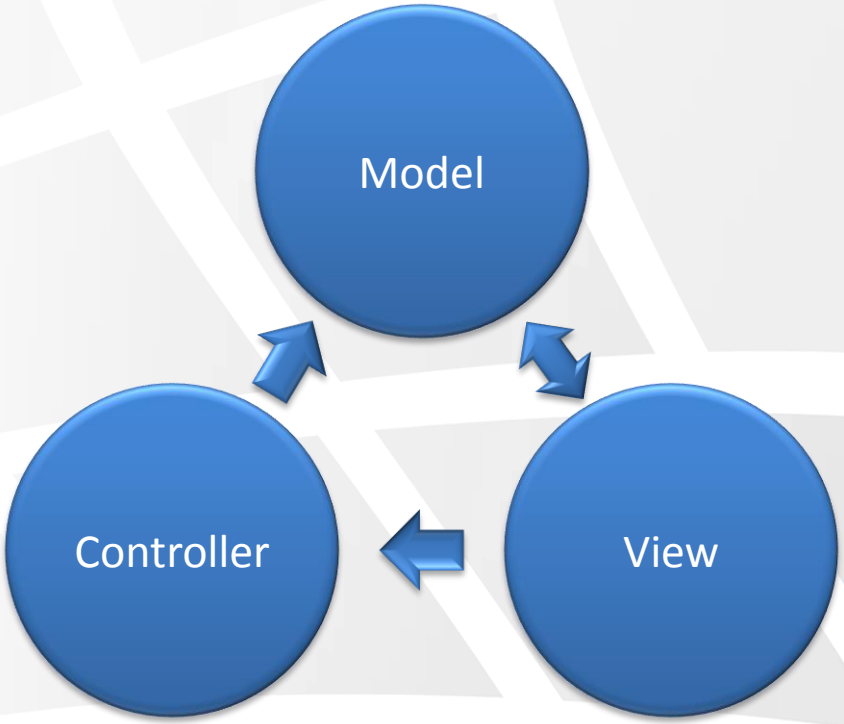


The Problem

- As we add more and more JavaScript, our application is getting:

Introduction to AngularJS

Model View Controller



MVC – The Model

- The business data
- Usually comes from a REST API
- Exposed to the view via the $scope

MVC – The View

- The HTML
- Binds to the model via the $scope
- Calls controller methods via the $scope
- Uses filters to transform the model
- Uses directives for DOM manipulation and reusability

MVC – The Controller

- Contains the business logic
- Interacts with services
- Initializes the $scope
- Exposes methods to the view
- Updates the model based on view interactions

Dissecting an Angular Application

- Below is the entire markup
- In the following slides, we'll walk through its various pieces

```
<!doctype html>
<html lang="en">
<head>
    <title>Hello Angular</title>
    <script src="bower_components/angular/angular.js"></script>
    <script src="app.js"></script>
</head>
<body ng-app="myModule">
    <div ng-controller="myController">
          <input type="text" placeholder="Enter your name" ng-model="name">
          <button ng-click="greet()">Say Hello</button>
    </div>
</body>
</html>
```

Dissecting an Angular Application

- First, the AngularJS script should be included in the page
- The application code (app.js) is included as well and will be discussed later

```
<!doctype html>
<html lang="en">
<head>
    <title>Hello Angular</title>
    <script src="bower_components/angular/angular.js"></script>
    <script src="app.js"></script>
</head>
<body ng-app="myModule">
    <div ng-controller="myController">
          <input type="text" placeholder="Enter your name" ng-model="name">
          <button ng-click="greet()">Say Hello</button>
    </div>
</body>
</html>
```

Dissecting an Angular Application

- The ng-app directive bootstraps the application, and instructs angular to load a module named *myModule*
- Directives are special angular components that add behavior to HTML elements.

```
<body ng-app="myModule">
    <div ng-controller="myController">
          <input type="text" placeholder="Enter your name" ng-model="name">
          <button ng-click="greet()">Say Hello</button>
    </div>
</body>
```

Dissecting an Angular Application

- The ng-controller directive associates a DOM sub tree with a specific controller
- Controllers are an angular component that provides the logic behind a specific view

```
<body ng-app="myModule">
    <div ng-controller="myController">
          <input type="text" placeholder="Enter your name" ng-model="name">
          <button ng-click="greet()">Say Hello</button>
    </div>
</body>
```

Dissecting an Angular Application

- The ng-model directive provides a two-way data-binding between a DOM element and a scope property
- The ng-click directive invokes a scope function when a DOM element is clicked

```
<body ng-app="myModule">
    <div ng-controller="myController">
          <input type="text" placeholder="Enter your name" ng-model="name">
          <button ng-click="greet()">Say Hello</button>
    </div>
</body>
```

Dissecting an Angular Application

- Below is the entire JavaScript code (app.js)
- In the following slides, we'll walk through its various pieces

```
var myModule = angular.module('myModule', []);

myModule.controller('myController', function($scope, $window){
        $scope.greet = function(){
                $window.alert("Hello " + $scope.name);
        };
});
```

Dissecting an Angular Application

- The angular.module method registers a new module named *myModule*

```
angular.module('myModule', []);

angular.module('myModule').controller('myController',
   function($scope, $window){
        $scope.greet = function(){
                $window.alert("Hello " + $scope.name);
        };
});
```

Dissecting an Angular Application

- The module.controller method creates a new controller inside of a module
- Dependencies are injected automatically

```
angular.module('myModule', []);

angular.module('myModule').controller('myController',
   function($scope, $window){
        $scope.greet = function(){
                $window.alert("Hello " + $scope.name);
        };
});
```

Dissecting an Angular Application

- A $scope is the context against which expressions in the markup are being evaluated

```
angular.module('myModule', []);

angular.module('myModule').controller('myController',
   function($scope, $window){
        $scope.greet = function(){
                $window.alert("Hello " + $scope.name);
        };
});
```

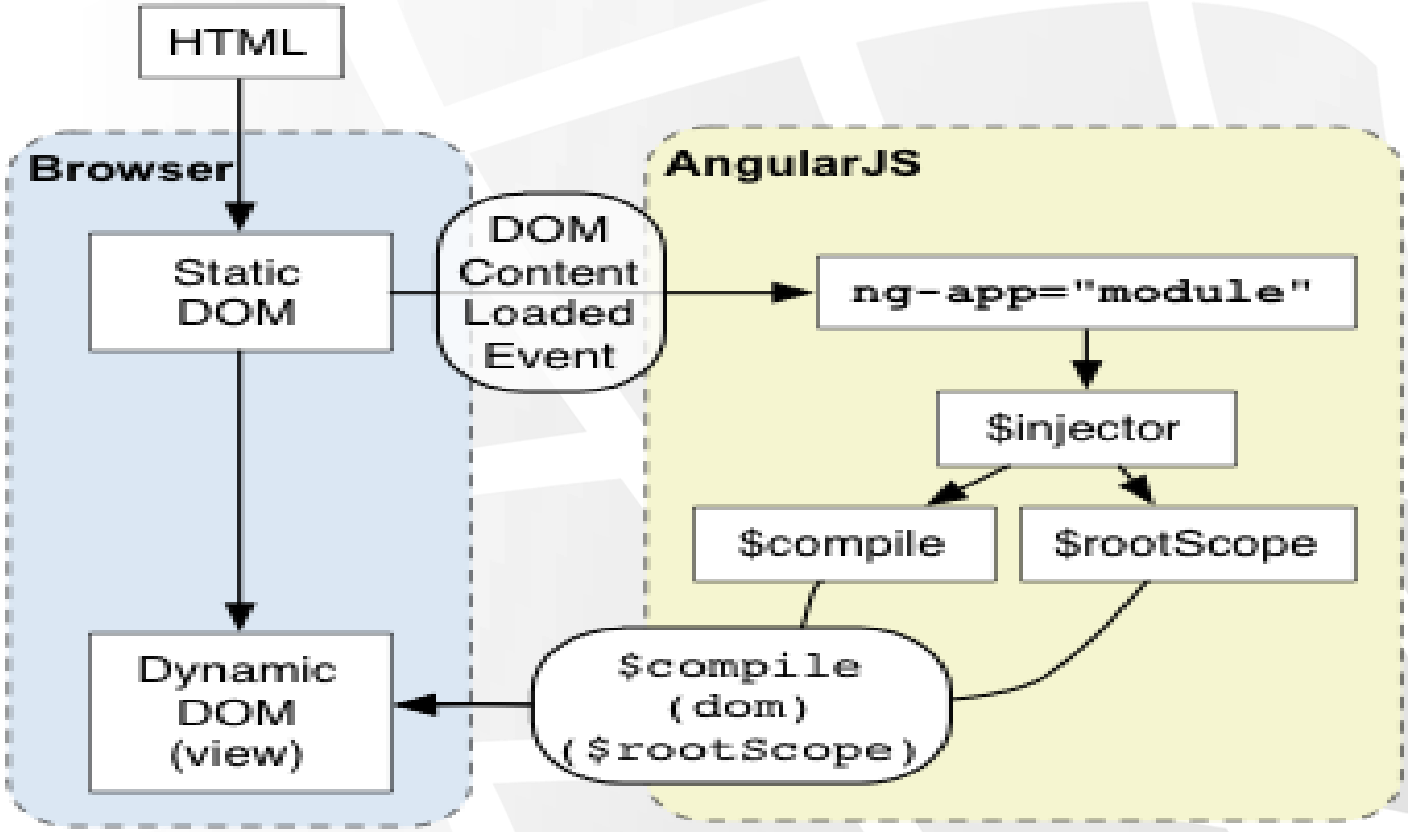
Angular Application Flow

- The browser makes an HTTP request to the server to load the initial template and scripts
- Angular loads and waits for the page to be fully loaded. Then, it searches for the ng-app directive and loads the associated module and its dependencies
- Angular compiles the template, adds listeners on DOM elements and evaluates bindings
- From now on – Angular is in charge

Bootstrapping

- There are 3 important things that happen during the angular application bootstrapping:
  - Angular creates the injector that will be used for dependency injection
  - The injector creates the root scope that will become the context for the model of our application
  - Angular compiles the DOM, starting at the element that contains the ngApp directive, processing any directives and bindings found along the way

Bootstrapping Steps



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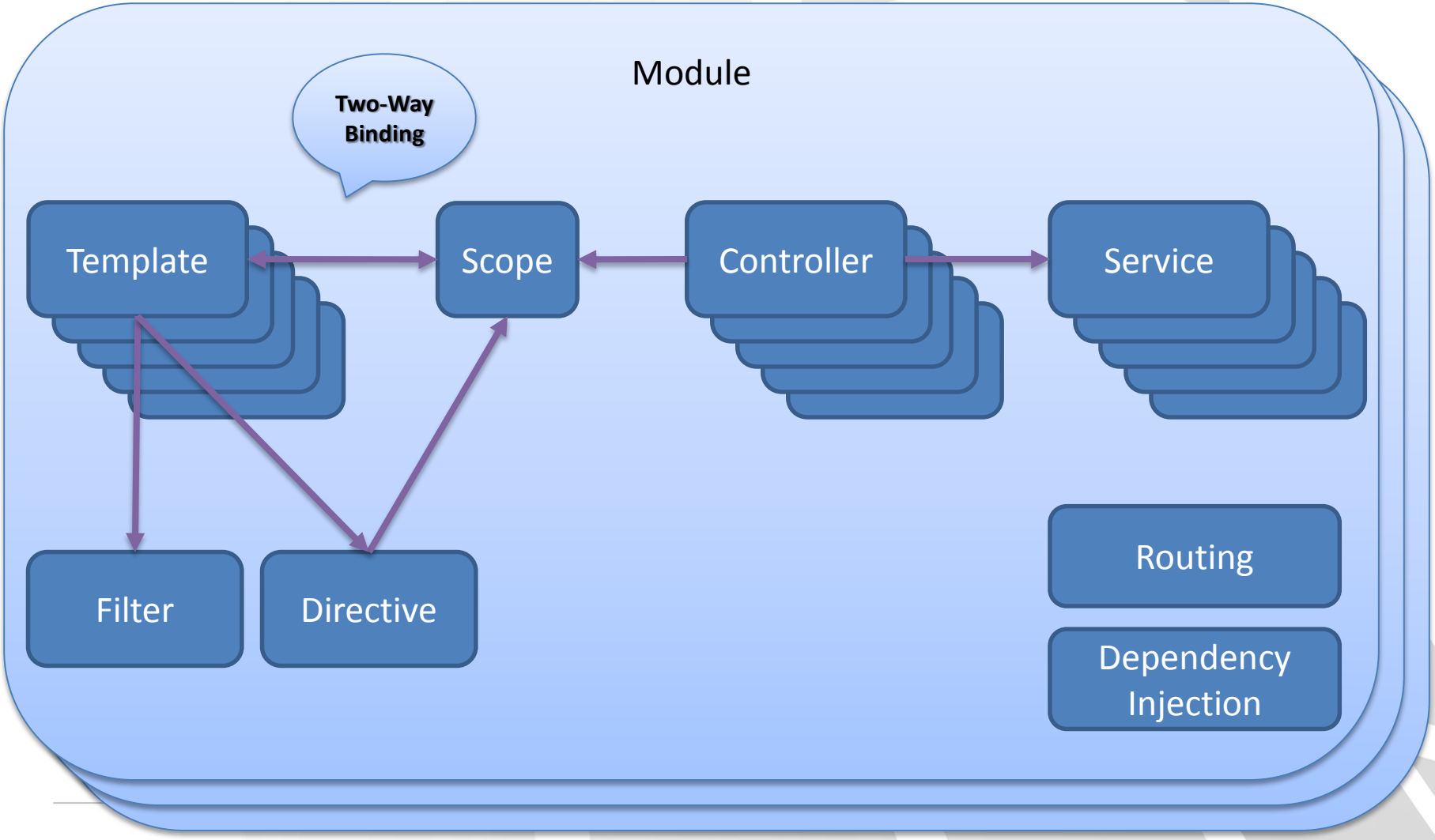
Angular Building Blocks



Setting Up The Environment

Getting AngularJS

- AngularJS can be downloaded from angularjs.org
- It can also be included directly from the google CDN

```
https://ajax.googleapis.com/ajax/libs/angularjs/1.2.13/angular.min.js
```

Getting AngularJS

- Alternatively, it can be installed via the bower package manager (requires npm)

```
npm install -g bower
mkdir myProject && cd $_
bower install angular
```

Services

The $http Service

- Used for communication with remote HTTP servers
- Based on the promise API provided by $q
- Is basically a function that receives a configuration object and returns a promise
- Provides shortcut methods for most common cases

The Configuration Object

- Describes the HTTP request to be made.
- Contains the following properties:
  - method
  - url
  - params
  - data
  - headers
  - transformRequest and transformResponse
  - xsrfHeaderName and xsrfCookieName
  - timeout
  - cache

Using The $http Service

```
// Invoke it as a function and provide a config object
$http({method: ‘GET‘, url: '/api/questions'})
   .success(function(data, status, headers, config) {
        // Called on success
   })
   .error(function(data, status, headers, config) {
        // Called on error
   });

// Or use one of the six shortcut functions
$http.get('/api/questions').success(…).error(…);
$http.post('/api/questions', question).success(…).error(…);
$http.put(('/api/questions', question).success(…).error(…);
$http.delete('/api/questions/1').success(…).error(…);
$http.head('/api/questions').success(…).error(…);
$http.jsonp(‘question?callback=callback').success(…).error(…);
```

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Filters

The Purpose of Filters

- Formats the value of an expression for display to the user
  - {{ expression | filter }}
  - {{ 10 | currency }} will display 10$
- May have arguments
  - {{ price | number:2}}
- Filters are chainable

Single-Value Filters

- currency – Formats a number as a currency
- date – Formats date to a string
- number – Formats a number as string
- uppercase – transforms a string to uppercase
- lowercase – transforms a string to lowercase

Using Single-Value Filters

```
// JavaScript
$scope.amount = 150;
$scope.dueDate = Date.now();
$scope.firstName = "John";
$scope.lastName = "Doe";
$scope.average = 99.12432;

// HTML
<p>Currency: {{amount | currency}}</p>
<p>Date: {{dueDate | date:'yyyy-MM-dd HH:mm:ss'}}</p>
<p>Lowercase: {{firstName | lowercase}}</p>
<p>Uppercase: {{lastName | uppercase}}</p>
<p>number: {{average | number:2}}</p>
```

Currency: $150.00

Date: 2014-02-16 18:01:53

Lowercase: john

Uppercase: DOE

number: 99.12

Array Filters

- filter – Returns a subset of the array with only the items that matches a given predicate
  - The default predicate performs a substring match. It can be overridden
  - The string can be matched against all the properties of the element or just specific properties
- orderBy – Orders the array by a element's property
- limitTo – Displays only N items from the array
  - Negative numbers are used to indicate that the last N elements should be displayed

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Validation

Built-In Validation Directives

- Angular provides the following validation directives:
  - required – Checks that a value exists
  - min – Checks that a value is greater than a given value
  - max – Checks that a value is lower than the given value
  - minlength – Checks that a value is longer than a given value
  - maxlength – Checks that a value is shorter than a given value
  - Pattern – Checks that a value matches a is given regular expression
- All of the above directives sets a validation error identified by their name when the condition is not met

Using the form and ngModel Directives

- Note the usage of the novalidate attribute to disable the browser's built-in validation

```
<form name="form" novalidate>
    <div>
        <input type="text" name="title" ng-model="question.title" required/>
    </div>
    <div>
        <textarea name="content" ng-model="question.content" required>
        </textarea>
    </div>
    <button ng-click="addQuestion(question)”>
        Submit
    </button>
</form>
```

Form State

- The state of each control and of the entire form is automatically managed by Angular
- There are 4 states:
  - $pristine – No interaction has been made yet
  - $dirty – Interaction has been made
  - $invalid – There are some validation errors
  - $valid – There are no validation errors

Binding to State

- Note the usage of the ng-show and ng-disabled directives to hide or disable controls based on the form's, or its elements', state

```
<form name="form" novalidate>
    <div>
        <input type="text" name="title" ng-model="question.title" required />
        <div ng-show="form.title.$dirty && form.title.$invalid">
            ...
        </div>
    </div>
    <button ng-click="addQuestion(question)" ng-disabled="form.$invalid">
        Submit
    </button>
</form>
```

Presenting Validation Errors

- Validation errors are exposed via the $error property of the form or a specific control
- The $error property is a object-hash, containing the state of each validator (true, false)

Binding to Validation Errors

- Note the usage of the ng-show to bind to the $error property bag

```
<form name="form" novalidate>
    <div>
        <input type="text" name="title" ng-model="question.title" required />
        <div ng-show="form.title.$dirty && form.title.$invalid">
            <span ng-show="form.title.$error.required">
                Title is mandatory
            </span>
        </div>
    </div>
</form>
```

CSS Classes

- Angular automatically sets CSS classes on the form and input elements:
  - ng-valid
  - ng-invalid
  - ng-invalid-[validation name]
  - ng-pristine
  - ng-dirty
- These classes can be used to change the style of the element according to its state

Using CSS Classes

- Setting the background color of the form's input elements to #FA787E to signal an invalid state

```
input.ng-invalid.ng-dirty {
   background-color: #FA787E;
}

textarea.ng-invalid.ng-dirty {
   background-color: #FA787E;
}
```

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SPA – Routing

Routing In Single Page Applications

- Unlike traditional web sites, in SPAs, the responsibility for rendering the view is on the client side
- We do, however, want to give the user the same features he is used to, like:
  - Using the browser's navigation buttons
  - Using the address bar for navigation
  - Bookmark specific pages
- How can we change the address bar without causing the browser to issue a new request?

The Pound (#) Sign

- The pound sign is called the URL-hash and used by web browsers for in-page bookmarking
- Changing what comes after the pound sign is handled entirely by the browser, and does not reload the page
- In SPAs, we can leverage it to achieve the goals described in the previous slide without issuing a server request

HTML5 History API

- Starting with HTML5, the contents of the browser's history stack can be manipulated through the pushState and replaceState APIs, exposed via the window.history object
- Using these APIs allows us to change the browsers address bar without reloading the page
- The new URL can be any URL in the same origin as the current URL
- These APIs are supported in all the modern browsers

The ngRoute Module

- Angular comes with a built-in router
- The router is packaged in its own module, named ngRoute
- To use the router, perform the following steps:
  - Install and reference the angular-route script in the HTML
  - Add the ngRoute module as a dependency to your module

The $location Service

- An abstraction on top of the window.location object
- Synchronized with the browser address bar and allows to watch or manipulate the URL
- Seamless integration with the HTML5 History API. Links are automatically rewritten to reflect the supported mode

```
<a href="/page1?id=123">link</a>
```

/index.html#/page1?id=123

/page1?id=123

Using the ngRoute Module

- Referencing the angular-route module

```
<script src="angular-route.js"></script>
```

- Adding a dependency on the ngRoute module

```
var myModule = angular.module('myModule', ['ngRoute']);
```

Route Registration

- Routes are registered in the module's config function, by calling $routeProvider.when with a path and a route object
- A default route can be registered with the otherwise method
- The contents of the route object is discussed in the following slides

```
myModule.config(function($routeProvider) {
   $routeProvider.when("/page1", {…})
                 .when("/page2", {…})
                 .when("/page3", {…})
                 .otherwise({…});
});
```

The Route Configuration Object

- Each route configuration object contains the following properties:
  - template / templateUrl – An HTML string, or a path to an HTML file, to be used by the ngView directive
  - controller – controller (or a registered controller's name) to associate with the template's scope
  - redirectTo – A name of a route to redirect to

The Route Configuration Object

```
myModule.config(function($routeProvider) {
   $routeProvider
        .when("/page1", {
                templateUrl:"partials/page1.html",
                controller: 'myController‘
        }).when("/page2", {
                templateUrl: "partials/page2.html“
        }).when("/page3", {
                templateUrl: "partials/page3.html“
        }).when("/page4", {
                redirectTo: "/page3“
        }).otherwise({
                templateUrl: "partials/page1.html",
                controller: 'myController‘
        });
});
```

The ngView Directive

- The ngView directive marks the place in which the new route's template should be rendered
- Can be used as an element, or as an attribute on any element

```
<body ng-app="myModule">
     <div>
          <ul>
               <li><a href="page1">Page 1</a></li>
               <li><a href="page2">Page 2</a></li>
          </ul>
     </div>
     <div ng-view/>
</body>
```

Parameterized Routes

- A route's path can contain multiple named parameters
- A parameter is prefixed with a semicolon. For Example:

```
/users/:id/orders/:orderId
```

- The parameters can be accessed via the $routeParams service by their name
- The $routeParams service contains the query-string parameters as well

Using Parameterized Routes

- Registering a parameterized route:

```
$routeProvider.when("/page3/:id/:name", {
        templateUrl: "/partials/page3.html",
        controller: 'myController'
   });
```

- Accessing the route parameters:

```
myModule.controller('myController', function($scope, $routeParams){
   $scope.name=$routeParams.name;
   $scope.id=$routeParams.id;
});
```

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Summary

- Angular is an MV* framework developed by google
- It contains various components that reduces the complexity of creating web applications
- It can be downloaded directly from the AngularJS site, or installed via bower or Yeoman

Questions?